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Landscape management on post-exploitation land using the example of the Silesian region, Poland

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ABSTRACT

More and more often, post-mining and post-exploitation areas, which have been heavily transformed by man's economic activities, are no longer a danger to the environment, but they enhance the monotonous urban-industrial landscape of a particular region and are instead its identifying value. Activities regarding the planning of landscape development are very difficult. This paper emphasizes some of the problems that result from legal barriers with regard to the concept of the more diversified management of post-mining areas as substantial forms of the landscape. In the process of the complex shaping of the natural environment in reclamation actions regarding post-mining areas geographers, biologists and architects have a large role to play. Due to the fact that landscape management falls within the scope of interest and competencies of many stakeholders, such as: government, regional and self-government institutions, nature, monument and state forest protection authorities as well as the scientific community from various disciplines, it is very difficult to reach a consensus in this matter and to develop uniform operating procedures. The landscape management problems on postindustrial areas have been illustrated through the example of the region of Silesia. The cultural landscape of the region has been intensively developed in the last thousand years, but signs of human impact are much older, dating back to the pre-historical and early Medieval periods. The Silesia region is currently undergoing a major spatial reconstruction.

KEY WORDS: post-mining areas, cultural landscape, Silesian Upland

1. Landscape management – scope of importance

Post-exploitation lands – are areas in which direct mining exploitation was conducted, increased by surrounding areas subject to environmental changes – resulting from this activity. These areas cover a growing area on a global scale. The contemporary matrix of the post-industrial urban landscape is dotted with large and small fragments of abandoned spaces, which need to be incorporated into the city texture (NIKEZIĆ & JANKOVIĆ, 2012). Abandoned Polish mining areas are commonly heavily transformed so that they no longer endanger the environment. A disadvantage is that the newly created areas commonly contribute to the monotonous urban-industrial landscape, rather than providing additional value. This is partly due to legislation that hampers a more diversified management of abandoned mining areas as

potentially valuable landforms. One of the legal barriers that restricts the possibility of making these areas more attractive, with regards to the utilization of the remaining exploitation holes (i.e. land depressions of at least 2 m deep, formed as a result of open-cast mining of energy, chemical, building or metallurgical resources) and waste heaps as important cultural and scenic elements (MYGA-PIĄTEK & NITA, 2008). Special forms of planning and landscaping have been introduced for these sites (CHAPMAN & WALKER, 1988; DETTMAR, 2007; DONADIEU, 2006). Economy and industry have been the causes and factors of development in post-socialist cities. Both of these have influenced the structural changes which were took place in Eastern Europe after 1989 (KISS, 2007; KORCELLI, 1995). Such lands are growing in size in Poland, with a particularly high concentration in the Silesian Upland (historically – in the regions of Upper Silesia and the Dąbrowa

Basin). Many centuries of exploitation of various materials have been conducted in former agricultural or forest areas, in combination with intensive and vigorous settlement processes as well as investing in communication and industry has led to dynamic environmental transformations and changes to the physiognomy of the region. It has led to the development of an anthropogenic landscape which is often referred to as a cultural landscape. This landscape occurs in the described area in many structural and functional forms.

A cultural landscape can be understood as "a historically shaped section of the geographical space, created as a result of combined environmental and cultural influences, making up a specific structure, with regional individuality perceived as peculiar physiognomy" (MYGA-PIĄTEK, 2012). Such areas require a particularly careful and integrated management. *Landscape management* is not a separate field of knowledge and so far it has not found support in the Polish legal system. It is necessary to understand *landscape management* as a manner of thoughtful, organised, effective action leading to the objective of maintaining and developing landscape values and increasing natural, cultural, physiognomic and symbolic values (MYGA-PIĄTEK & PAWŁOWSKA, eds. 2008).

Currently, landscape development (also referred to as formation) occurs with the consideration of the idea of balanced development; is the designed transformation of an area which preserves the naturalness of the environment and cultural traditions, both material and spiritual, to the highest possible extent. These activities require extensive knowledge of the region's landscape values and competencies within the scope of law and management. Familiarity with the region's geography and history, as well as its traditions, constitutes a basis for the proper development of today's landscape (MYGA-PIĄTEK, 2001). The development of democracy in compliance with the idea of a civil state increases the chance for citizens to participate in various aspects of social life. At the same time, it introduces a large degree of freedom to make decisions, also in the scope of land development. Meanwhile, it is necessary to strive to create a situation where by applying effective methods and rules it will be possible to combine the interests of three groups: 1) public administration – represented by territorial self-government at various levels, nature and cultural protection institutions as well as other institutions; 2) professionals from the field of land management, including geographers (environmentalists), city planners, architects, 3) community –landscape protection is conducted for the people by the

people and should take place with the maximum involvement and participation of local communities. Landscape management in Poland remains the weakest link of measures in the scope of nature protection, environmental protection, historic preservation and spatial planning (MYGA-PIĄTEK & PAWŁOWSKA, eds., 2008; RASZEJA, 2003; ŻARSKA, 2003; EUROPEJSKA KONWENCJA KRAJOBRAZOWA, 2006).

2. Outline of the evolution of the cultural landscape of the Silesian region

The cultural landscape of the region has been intensively developed in the last thousand years, but signs of human impact are much older, dating back to the pre-historical and early Medieval times (Przeworsk and Lusatian cultures). The foundation of the anthropogenic landscape development were specific elements and resources of the natural environment. The hypsometrically diverse land segmented with numerous river valleys which have always constituted natural communication routes was suitable for the migration of tribal groups and transmission of all cultural models. Relatively light and easy to cultivate soils as well as rivers forming water gaps in the proximity of inselbergs created unique conditions for settlement. The natural landscape, mostly forest, was gradually transformed into an agricultural and settlement landscape. Fortified settlements, constituting the origins of pre-urban settlements, were established on numerous monadnock-type hills (in Będzin – St. Dorota's Mountain, Castle Hill), since early Medieval times, in the 13th century they began to receive their first municipal rights. Location near the border between Silesia and Małopolska facilitated the construction of a line of fortifications in the form of castles and watchtowers. One of them is a 14th century castle in Będzin (MYGA-PIĄTEK, 2001). Moreover, the location of the historic settlement was related to mineral mining. Middle Triassic dolomite rocks hold galena and calamine deposits. Mineral mining and smelting began in the 11th century in the area of the Ząbkowice Hummock, but there are hypotheses that lead was extracted in this region even in the second half of the first millennium. Up to the 14th century the exploitation was conducted in the form of small, irregular surface excavations and shafts reaching down to the groundwater level. The first dewatering galleries were built after the 15th century. Zinc has been extracted from calamine since the 18th century, while in the 19th century new smelting technologies contributed to the

intensification of the exploitation. Underground exploitation was conducted in the area of 15 km², and open-cast extraction on another 10 km². The exploitation of shallow bog ore deposits in the area of Upper Silesia began almost at the same time (since the 12th century), while the exploitation of siderites and limonites in the area of Triassic rock outcrops commenced in the 13th century. Ore processing plants began to gradually appear in the region: numerous bloomeries and ironworks, and large lignite-fired furnaces since the 18th century. The invention of coke-fired smelting furnaces in the 19th century significantly intensified the ore smelting process and led to an increase in extraction. It is estimated that during the period of highest mining production, at the turn of the 20th century, the extraction of iron ore in the entire Upper Silesia region exceeded 26 million tonnes (DULIAS, 2013). Several smelting furnaces operated in the area of Sosnowiec and Dąbrowa Górnicza at the time. Open-pit mining of iron, zinc and lead ore caused significant and extensive changes to the relief. The landscape began to be dominated by open pits, heaps, washeries, sediment basins, shafts, dewatering galleries, tracts discharging mining waters and smelting furnaces.

The oldest references to lignite mining date back to the 16th century. Exploitation that can be proven by documentation has been conducted continuously since 1740. Since the end of the 18th century, the development of the mining industry has led to substantial landscape transformations. The construction of the railway in the territory of Upper Silesia significantly intensified the mining process. Several dozen new mines were created from Mysłowice to Zabrze as well as on the Rybnik Land (DULIAS, 2013). Until World War I, 32 mines operated in the area of the Dąbrowa Basin alone. In the post-war period coal became the pillar of the socialist economy. Another 22 underground and 33 open-cast mines were constructed, with the largest being the "Brzozowica" mine in the area of Będzin. The landscape became saturated with characteristic winding towers and land used for the purpose of the industrial infrastructure were increasing in size (Fig. 1). The development of mining and industry was followed by the appearance of characteristic buildings of workers' housing estates, known in Silesia as "familoki". In the Coal Basin, such housing estates, erected from stone or bricks, can also be found in most industrial neighbourhoods (Warpie, Koszelew). Due to the harvesting of wood for the purposes of the mining, smelting and construction industries, the forestation rate has dropped drastically.

Large-sized excavations, waste tips, gangue heaps, shafts, warehouses, sedimentary basins, coal yards, dumps and illegal coal pits were being created in the centres of modern cities with historic roots (Bytom, Gliwice, Będzin). In time, subsidence basins also began to deform urban areas, leading to the complete destruction of the infrastructure. In the surrounding agricultural and forest areas, land subsidence over mines led to the formation of numerous reservoirs which, as time passed, began to be commonly referred to as anthropogenic lakes (RZĘTAŁA, 2008). New cities, constituting workers' housing estates, were developing chaotically, while previous rural settlements were being administratively merged into municipal units (such as Sosnowiec). The exploitation of raw rock materials was also conducted in the region since the 19th century. Large areas were used for the purpose of extracting mainly sand (Jaworzno-Szczakowa, Maczki-Bór, Kuźnica Warężyńska) which was used for stowing in mines (DULIAS, 2010). Hundreds of kilometers of a special sand railway, constituting a unique communication solution on a Polish scale with tens of bridges, viaducts and tunnels, were constructed in order to transport sand to mines. Triassic dolomites (i.e. in the Gródek quarry) and limestones (i.e. in the Sadowa Góra quarry) were also mined. Intensive exploitation resulted in the emergence of a dozen or so sandpits and several dozen solid rock quarries. A remainder of the cement industry are the ruins of the first cement factory "Grodziec" in Będzin (NITA & MYGA-PIĄTEK, 2006).

During the period of the centrally managed, planned economy (1945-1990), urban landscapes sustained the most damage. "Implants" of industrial plants were being incorporated into the previous urban structure; and new industrial neighbourhoods were being erected (i.e. Łagisza in Będzin); the coal energy industry was developing intensively. Until the 1980s agricultural landscapes were directly bordering mountain and industrial landscapes, and the rural population found employment in the industry. A characteristic trait was the wide contrast of landscapes – fields stretched all the way to mine borders. Currently, the relics of such exploitation can still be seen in Środula – a neighbourhood of Sosnowiec, Grodziec – a neighbourhood of Będzin, as well as in Gliwice, Piekary Śląskie and Chorzów. Natural forests were reduced to the so-called protective belts or artificial plantings were introduced. At the same time, the degraded landscapes which were excluded from planned use were subject to slow renaturalisation by means of spontaneous plant

succession (TOKARSKA-GUZIK, 2003). Unique, on a Polish scale, communities and ecosystems were developing on post-mining and post-industrial lands (CZYŁOK, 2004; CZYŁOK & RAHMONOV, 1996). The tertiary phase of civilisation created a need to restructure the industry and develop the service sector. Suburban areas, formerly used as agricultural lands, were subject to intensive suburbanisation and development by means of constructing warehouses and retail structures.

The current nature of the landscape of the Silesian region needs to be considered as a synthesis of settlement, agricultural, mining, communication and industrial processes, secondary recultivation and renaturalisation processes as well as social and economic effects of globalisation. The processes described herein concerned only the material layer of the landscape; equally important and more difficult with regard to revitalisation is the non-material layer related to the once very lively spiritual culture, tradition, folklore, religion, rituals and local dialect.

3. Landscape development – in search of *genius loci*

In the process of the anthropogenisation of the Silesian (region) area, humans not only destroyed the landscape, but also often maintained and knowingly developed it. Therefore, it is possible to distinguish at least three approaches in the cultural landscape evolution process: 1) vigorous development which arose spontaneously and not completely knowingly from a specific socio-economic, political – administrative – legal (borderland area between the three partitioners) and political (socialist period) situation of the region; most often the landscape that was formed had a chaotic structure, was incoherent, multi-functional and had a degraded form; 2) functional development which consisted in the conscious transformation of the landscape in reference to the natural and cultural potential and character – landscapes designed to perform a specific function were formed; this approach also included recultivation activities; 3) aesthetic development – which consisted in purposeful and designed introduction of elements to the landscape, which were being exhibited in accordance with the applicable norms and aesthetic styles. The landscape was composed harmoniously, the rules of spatial order were being complied with and the spatial traditions were being upheld. City centres were reconstructed in accordance with the current architectural trends (i.e. secession, modernism); the ecological and aesthetic functions

of cities were being gradually restored. Park and garden greenery was being maintained. This approach included revitalisation activities for degraded urban areas, post-industrial and post-exploitation areas as well as socially excluded housing estates.

Currently, the management of post-exploitation areas is based on the second and third approach and is aimed at bringing out their unique, individual and distinct identity arising from the co-existence of natural values and the values of economic culture (MYGA-PIĄTEK, 2012; PUKOWIEC & KURDA, 2013). Landscape management is a long term and a multi-directional activity consisting of the systematic reinforcement of natural values and the region's ecological function, breaking down mental barriers, developing the responsibility for landscape by rebuilding society's connection to the local environment for the purpose of restoring the lost *genius loci* of the region (MYCZKOWSKI, 2003; WIELGUS & ŚRODOULSKA-WIELGUS, 2003; SZCZEPAŃSKI, 2000).

The Silesian region is currently undergoing a major spatial reconstruction. After a period of vigorous transformation, the process of conscious and planned reconstruction of the landscape's material layer and largely damaged spiritual layer is commencing, by utilising the knowledge and experience of specialists from many fields of science and practice: geographers, biologists, landscape ecologists, landscape architects, city planners, cultural experts, ethnographers and sociologists (DETTMAR, 2007; MYGA-PIĄTEK & PAWŁOWSKA, eds., 2008). This process utilises international experiences. A framework for this enterprise is, above all, the European Landscape Convention signed by Poland. A valuable and useful initiative of the European Union for the Conservation of Nature (IUCN) is the development of the Red Book of threatened landscape values (Resolution 19.40. Conservation of Threatened Landscapes adopted by the IUCN General Assembly in Buenos Aires). This resolution emphasizes the need to protect cultural landscapes, with particular focus on areas transformed by the activity of the mining and processing industry.

4. New management model – approaches to post-mining land development

There is a popular approach to land development, referred to as *ecovention* (*ecology and invention*), among the specialists working on spatial planning in post-exploitation areas. More and more popular it becomes an "Eco-Infill" strategy (fragments of nature incorporated into an abandoned artificial

environment) as a viable, “alternative”, urban development strategy (NIKEZIĆ & JANKOVIĆ, 2012).

By utilising cutting edge ideas, methods and management strategies, this approach aims to reclaim “lost areas” for cities and their inhabitants, secondary development of *brownfield* type areas as well as degraded and damaged lands (SPAID, 2002; DONADIEU, 2006). The transformation of these lands occurs through their adaptation into various public-purpose forms, such as educational institutions (educational and didactic centres), technology parks, picnic areas, museums and open-air ethnographic museums, cycle paths, sports areas, operas, amphitheatres, parks, botanical gardens, rockeries, geosites for geological as well as mineralogical didactics and tourism (MYCZKOWSKI, 2003; PIETRZYK-SOKULSKA, 2003; 2004; ROSTAŃSKI, 2012; TOKARSKA-GUZIŁ, 2003; ZACHARIASZ, 2003).

An example can be the implementation known from many European countries. A public park where rock cliffs, steep walls and waterfalls were exhibited consciously was created between 1864-1867 in Butters-Chaumont, in the Paris neighbourhood of Belleville (a former limestone quarry). The lands of the former sandstone and clay quarry were developed in the upper Rhine river basin. The Musital Quarry, located in a narrow valley, was developed so as to emphasize the characteristics of the local landscape, with steep slopes and terraces dedicated to the cultivation of vines and fruit trees in orchards. Apart from its agricultural function, this place also serves a leisure and recreation function. Another example is the Biville Quarry in France where following a landscape study architects decided to create a completely different type of landscape – a new value was given to the degraded area that is

currently comprised of cascading waterfalls and ponds incorporated into rock cliffs (NITA & MYGA-PIĄTEK, 2005, 2006). Near Milan, in a quarry left behind after the exploitation of gravel, a Cava Nord Public Park, encompassing an area of 37 ha and a system of lakes with the length of 700 m and width of 150 m, was developed. The best known implementation outside Europe is the Brazilian Curitiba in the Parana state where the famous Wire Opera House was erected in park surroundings in the Parque Das Pedreiras quarry. Parks were also established in other Brazilian quarries, i.e. in Bosgue Zaninelli and Parque Tanga. In all the above-mentioned examples, the basic materials of the spatial composition are elements uncovered as a result of mineral mining, that is naked and sharp rock walls as well as water (ZACHARIASZ, 2003).

Such implementations exist also in Poland. The quarry in Pogórze (Kraków) is worthy of mention as a landscape park that was developed between 1896-1909, or the park and amphitheatre in the quarry in St. Anna’s Mountain (implemented between 1934-36). Numerous adaptations of quarries in Upper Silesia have been positively acclaimed, i.e. in Sadowa Góra, Gródek, Rudniki, Dolomity Sportowa Dolina (Fig. 2), where abiotic values and unique plant species have been combined with a park arrangement as well as educational and recreational purposes. Projects regarding the development of former sand quarries in Dąbrowa Górnicza, known under the names of Pogoria I, II, III and Kuźnica Wareżyńska (Pogoria IV), have received positive reviews. Ecological functions are in line with social expectations. The development of these lands has been water-sports and tourism-oriented (NITA & MYGA-PIĄTEK, 2005, 2006).



Fig. 1. A typical anthropogenic landscape in Będzin town in the Silesian region, (U. Myga-Piątek)

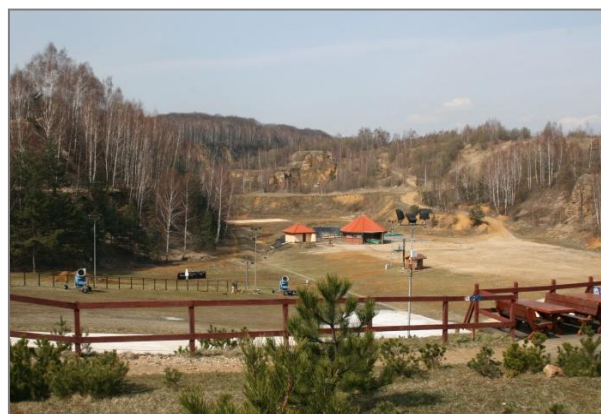


Fig. 2. “Dolomity – Sportowa Dolina” in Bytom. Dolomite quarry – an example of adopting land for recreation purposes (U. Myga-Piątek)



Fig. 3. "Murcki" Coal Mine and post-exploitation areas (*J. Nita*)

The most common example of the development of former spoil heap areas is the forest-oriented recultivation consisting of planting trees for the purposes of a new recreational function. The best known example is the Voivodeship Park of Culture and Recreation in Chorzów, developed in the 1950s on post-mining land and spoil heaps. The largest urban park in Poland was developed on 620 ha of post-mining barren lands of the former "Prezydent" mine. Land depressions were used to incorporate ponds into the landscape. Major ground works, related to the repositioning of gangue mass and terrain levelling, were conducted in order to create the park. Another example is the F. Kachl Urban Park in Bytom, developed on 43 ha of the former "Teresa" mine. The heaps of the "Janina" Coal Mine in Libiąż were also developed for recreational purposes by performing recultivation using the FRISOL method (for the first time in Poland); similarly the heaps of the "Borynia" Coal Mine in Świerklany, "1 Maja" Coal Mine in Wodzisław Śląski, "Wieczorek" Coal Mine in Katowice, "Halemba" Coal Mine in Ruda Śląska and "Rozbark" Coal Mine in Bytom. Other examples of such development can be greenlands on spoil heaps of the "Murcki" mine in Katowice-Kostuchna (a project of a leisure and recreation park) (Fig. 3); Śródulą park in Sosnowiec, Park in Czeladź-Piaski, as well as the Warpie park (NITA & MYGA-PIĄTEK, 2005, 2006). Another purpose may be given to one of the largest cone-shaped heaps in Europe – steep heaps, i.e. in the Rybnik Coal Area (Jastrzębie, Rydułtowy) – Czerwionka - Leszczyny, which are most often used for sports purposes – alpine slides and ski trails, but also as scenic overlooks. One of the most interesting concepts for the development of lands used for the

purpose of coal exploitation is the one developed by a team of architects under the direction of BOGDANOWSKI & MYCZKOWSKI (1994). This project, concerned the lands occupied by the Piast Coal Mine, and was based on two assumptions. The establishment of a homely landscape ensuring leisure in conditions satisfying ecological, aesthetic and functional norms, and the use of spoil heaps as a component of the economic identity of Silesians (SZCZEPAŃSKI, 2000).

However, the development processes of these lands are difficult, long term and always carry a certain risk regarding the lack of social acceptance or return on equity. Therefore, they are often met with resistance from local authorities. Mental barriers and the fear of the risk of alternative development constitutes an impediment to the implementation of innovative adaptation solutions. The lack of knowledge among local decision makers regarding the spatial values and the need to maintain them still constitutes a large problem. The process of the development of these lands requires interdisciplinary consultations and the involvement of various professional groups as well as social consultations. Until now, the biggest barrier in the management of these lands were the legal and mental constraints. The applicable acts on nature protection, protection and conservation of monuments, spatial planning, environmental protection law and construction law, have a sectoral – unidirectional – and negative approach to post-mining landscapes. With the simultaneous lobbying of foresters, botanists and zoologists in works on the approach to recultivation, the forest-oriented approach ignoring the discovered abiotic and cultural values usually prevailed (NITA, 2013; STAWICKI, 2003).

The issue of developing these lands remains a difficult and complex topic so that they are harmoniously incorporated into the urban, or open suburban, space and so that they do not become a hot topic for the media or an object of ecological conflict. Sites of mining activity in the Silesian region are distinct proof of the economic history of the entire country. In comparison to the great concern given to other historic sites (palaces, manors, castles, tenement houses, etc.) and their declaration as monuments, for many years sites related to several centuries of the history of industry were not worth commemorating for persons responsible for the spatial management of the Silesian region. What is more, they were treated as spatial components that need to be "cleaned up" as soon as possible, as if they were shameful or unsightly.

In certain sites, especially badly preserved spoil heaps with a large amount of coal in gangue, it is often the case that the spoil heap catches fire and emits smoke. Smoking heaps in Siemianowice or the Skalny heap in Łaziska Górne were until recently examples of such occurrences (DYBIAK ET AL., 2000; OSTAFICZUK, 2000). However, most heaps are stabilised – i.e. the cone-shaped heap with a height of 17 m, formed as a result of 120 years of operation of the "Fryderyk" Silver and Lead Mine, which constitutes a very good scenic overlook. Despite the fact that it is an artificial structure, it is currently being shaped by natural processes – numerous erosion incisions and cone-shaped waste tips are developing at its base, and is used for scientific observation purposes. The formation undergoes renaturalisation.

Activities regarding the planning of landscape development are very difficult. It was not possible to avoid making irreversible errors resulting from the lack of awareness and knowledge concerning the actual values of these sites and quick economic benefits for the community. Vigorous and rushed pseudo-recultivation activities resulted in the loss of many unique landscape formations. One of them was the inundation of a unique type of exposure of the Coal Measures which was formed in an open-cast coal excavation at the "Brzozowica" mine in Będzin (MYGA-PIĄTEK, 2004). Certain spoil heaps, mainly mining heaps, have already been used and stripped for such purposes as secondary coal recovery or stone recovery for road construction. This is the purpose of the enormous heap located near the road from Bytom to Piekary Śląskie, which has been systematically exploited for several years. The exploitation of stabilised heaps that do not emit dust, and are covered with vegetation (after 20–50 years

following the discontinuation of tipping), is an inappropriate activity that has a negative impact on the indigenous characteristics of the landscape.

5. Conclusion

Due to the fact that landscape management falls within the scope of interest and competencies of many stakeholders, such as: government, regional and self-government institutions, nature, monument and state forest protection authorities as well as the scientific community of various disciplines, it is very difficult to reach a consensus in this matter and develop uniform operating procedures. At the same time, the existence of the above-mentioned acts in our legislation should create a basis and realistic possibilities for the effective management of landscape protection. However, currently there is no integrated system for protecting natural and cultural landscapes due to the lack of executive resolutions specifying concrete operating procedures. Landscape protection policy is still dominated by the sectoral management approach. It applies, in particular, to urban-industrial and post-mining landscapes. Since 2013 there is a draft presidential Act that may constitute a clear prospect for arranging post-industrial lands by strengthening landscape protection instruments. The draft Act will introduce an obligation to prepare a landscape audit for the voivodeship area. The landscape audit will identify the types of landscape occurring in the voivodeship area, specify their characteristic traits and evaluate them. The landscape audit will specify, in particular: the location of priority landscapes; hazards to the possibility of preserving the values of priority landscapes; planned priority landscape protection instruments, in particular an indication of areas for which the adoption of urban principles of landscape protection is justified and areas which should be covered by forms of nature protection. The establishment of an obligation to conduct a landscape audit may be considered as an important step and clearly progress in the landscape management process.

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